

## GROUNDWATER STUDIES IN EASTERN REGION AND CHACO (PAR/8/006) F4 New

### MODEL PROJECT

#### CORE FINANCING

YEAR	Experts		Group Activity	Equipment	Fellowships		Scientific Visits		Group Training	Sub-Contracts	Misc. Comp.	TOTAL
	m/d	US \$	US \$	US \$	m/d	US \$	m/d	US \$	US \$	US \$	US \$	US \$
1997	2/15	33,000	0	40,000	3/0	9,450	0/15	4,800	0	5,000	0	92,250
1998	1/0	13,950	0	10,000	3/0	9,900	0/0	0	0	5,000	0	38,850

First Year Approved: 1997

**OBJECTIVES:** This project addresses the development objective of improving the quantity, quality, and sustainability of critical groundwater resources. Specifically, the project's aims are (i) to demonstrate the application of isotope hydrology to elucidate the origins and dynamics of representative aquifers at two study sites; and (ii) to establish the routine use of these techniques by institutions responsible for water management policy at the local, regional and national levels.

**BACKGROUND:** The Paraguay River marks the dividing line between two distinct ecological zones. The eastern region has a surface area of 159,827 km<sup>2</sup> (40% of the total) and 97.5% of the population. This region's annual precipitation of 1500 mm and abundant irrigation from rivers and streams create favourable conditions for crops and livestock. In spite of the availability of surface water resources, water supply for urban and rural populations depends heavily on groundwater. Good aquifer conditions lead to extensive exploitation. However, limited information exists on the main properties of these aquifers. Pollution is present in places subject to overexploitation and lack of protective measures. There is no regular monitoring of the groundwater systems. The exact number of wells in operation is not known. The National Service for Environment Sanitation (SENASA), of the Ministry of Public Health and Social Welfare, deals with water supply for settlements with less than 4000 inhabitants in this part of the country. The National Civil Works Corporation (CORPOSANA) is responsible for larger communities' water supplies. The western region, known as Chaco, has 60% of the land, but only 2.5% of the population. It is a relatively dry region with a yearly precipitation of about 600 mm. Very saline groundwater is present at relatively shallow depths. However, due to the distribution of precipitation throughout the year and to the properties of the soils, there is a permanent green cover over the region. Deforestation is causing rising water tables in places, leading to the appearance of salts in soils and on the surface. Localized pockets of fresh water represent a major source of drinking water. The origin and dynamics of these fresh water bodies is not well known. An artificial recharge plan is under consideration to help guarantee the water supply of small towns located in the central part of the Chaco region. Environmental isotopes and chemical data are a powerful tool for evaluating the validity of such plans. The Directorate of Water Resources of the Chaco (DRH), Ministry of Public Works and Communications, together with the Federal Institute of Geoscience and Natural Resources, Hannover, Germany, is studying the region's basic hydrogeology. Project PAR/8/005, completed in 1996, helped establish laboratories at CORPOSANA. These are operating, and have produced tritium determinations in groundwater from aquifers in both the eastern and Chaco regions. Tritium concentration data in precipitation is also available. Also under PAR/8/005, the staff of CORPOSANA, SENASA and DRH attended a seminar on practical applications of isotope and geochemical techniques in groundwater studies. The current project stems from this meeting.

**PROJECT PLAN:** Two areas with serious water problems will come under study during the next two years: a) The first area is located in the eastern region and extends over three departments: Central, Paraguari and Cordillera. Around 120 wells are in operation, but several towns report rising pollution levels and changes in water quality and quantity. The lack of hydrogeological information prevents proper management of groundwater. The project will provide key information on water origin and dynamics, as well as on characteristics of the aquifers needed to locate new wells. This will lead to direct feedback between the results of the investigations and the management strategy for the systems. Additionally, a proper assessment of pollution will lead to actions to mitigate or prevent the adverse effects of poor quality drinking water. b) The second study area is located in the Chaco, near the city of Filadelfia. Concentrations of agriculture, livestock, and industrial production characterize this locality. Water shortage is a key limiting factor in the development of the region. Many communities rely on shallow groundwater resources that occur as floating pockets over salty water. It may be possible to extend the size of these pockets through artificial recharge. Additional studies will address the environmental aspects of rising water tables, and its effects on local ecosystems. In both study areas, field campaigns will collect basic hydrogeological, geochemical and isotopic data. Reports based on field data, together with analytical data from local and outside laboratories, will lead to the recommended actions and support sound strategies for siting new wells.

**NATIONAL COMMITMENT:** Qualified staff from all participating institutions will be available for the project. SENASA has 30 engineers. Two engineers and two technicians from the Water and Sanitation Directorate involved in isotope methodology will support field work. The DRH group is composed of 25 persons, seven of them with good backgrounds in hydrogeology, computing and hydraulics. CORPOSANA will furnish two professionals and three technicians. SENASA and DRH have fully operative drilling equipment and basic field instrumentation. They are legally responsible for groundwater management in their respective areas. CORPOSANA will co-ordinate the project and provide hydrochemical and isotope laboratory services. The participating institutions will defray all operating costs. The three institutions dealing with water supply to the population are already involved in the investigations and aware of the role of isotope and geochemical techniques in this endeavour. CORPOSANA and SENASA have signed an agreement covering the eastern part of the country, while DRH has been working in the Chaco region for more than six years.

**AGENCY INPUT:** The Agency will provide expertise and expert services on hydrogeology, interpretation of isotope data and analytical aspects; analytical instruments for improving hydrochemical and isotope results (tritium and C-14); some field equipment; basic training in the use of geochemical and isotope techniques in water resources assessment and management.

**PROJECT IMPACT:** The immediate end users of the isotope technology are SENASA, CORPOSANA and the Directorate of Water Resources of the Chaco, the institutions legally responsible for water resources. The introduction of isotope techniques will permit the proper evaluation of the groundwater resources in the two study areas, leading to the establishment of guidelines for management and sustainable exploitation of groundwater. The project will directly benefit a population of 132,000, distributed in 60 communities in the eastern region. In the Chaco, about 32,000 inhabitants living in urban areas will benefit, as well much of the rural population, including indigenous peoples. In the medium term, water supply will increase, and water quality will improve.